

## Integrated Plan

06/5/2013

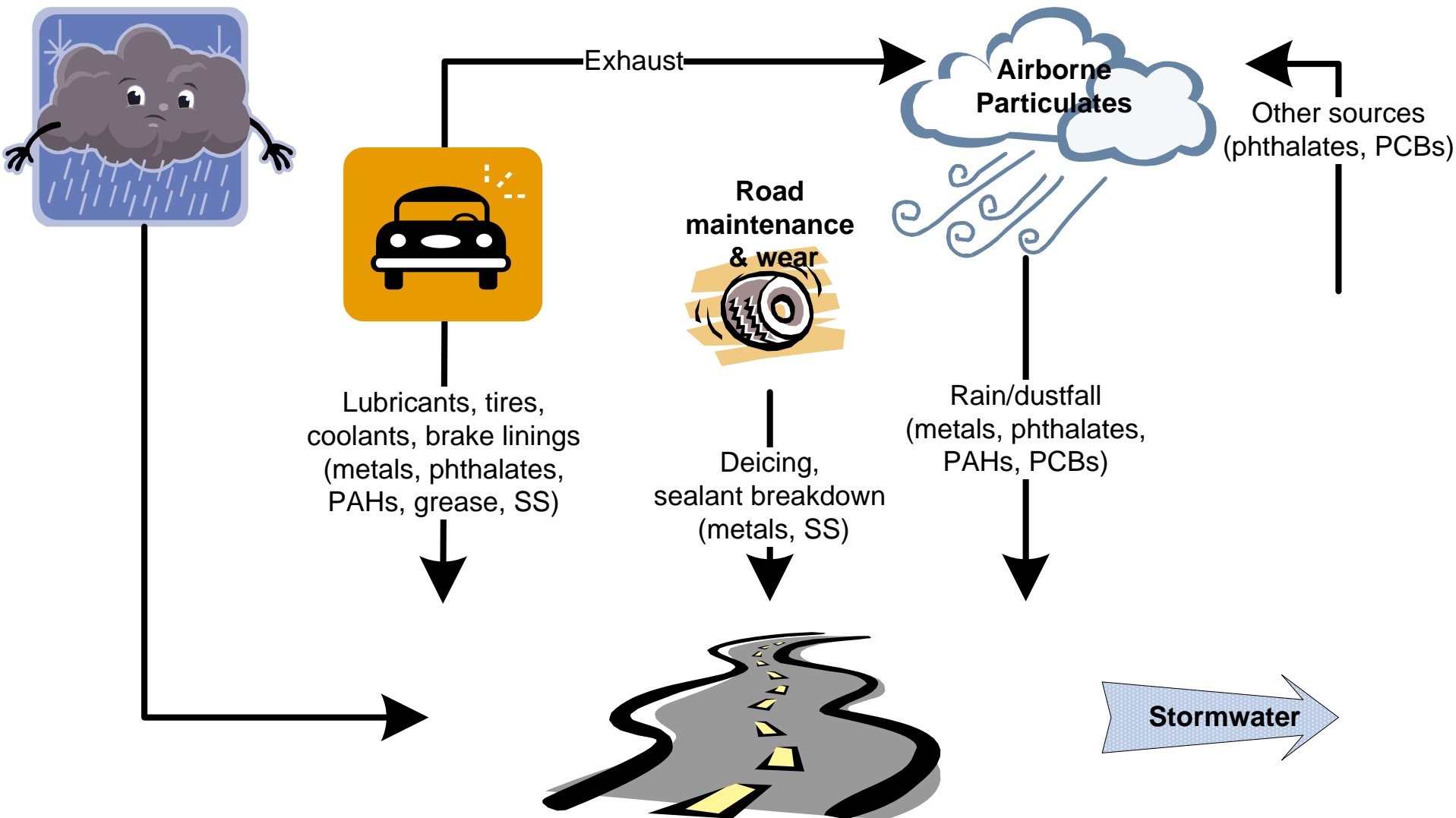
**Key Points to Support Street Sweeping as an Alternative**

# The Street Sweeping for Water Quality Program began in February 2011.

- Addresses stormwater runoff from the city-owned right-of-way, a high priority stormwater quality focus.
- Prevented a significant pollutant load from discharging to receiving waters during 2011 and 2012.
- Partnership between Seattle Public Utilities (SPU) and Seattle Department of Transportation (SDOT). SPU reimburses SDOT based on meeting criteria for payment: WQ route swept with a regenerative air sweeper at the specified frequency and velocity.



Roadways are a source of pollutants that present risks to aquatic life and the beneficial uses of our receiving waters.



**The Problem** - stormwater runoff from Seattle's streets poses a threat to receiving waters.

There is limited technology that is effective and feasible to implement within the right-of-way.



Installing devices  
with multiple utility  
conflicts.



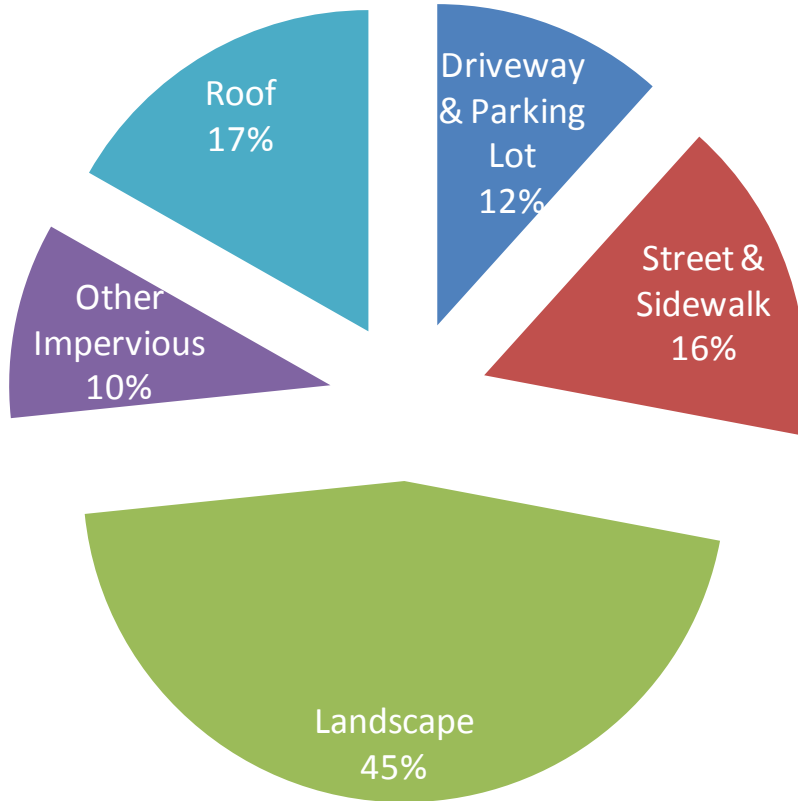
Getting  
stormwater to the  
treatment device.



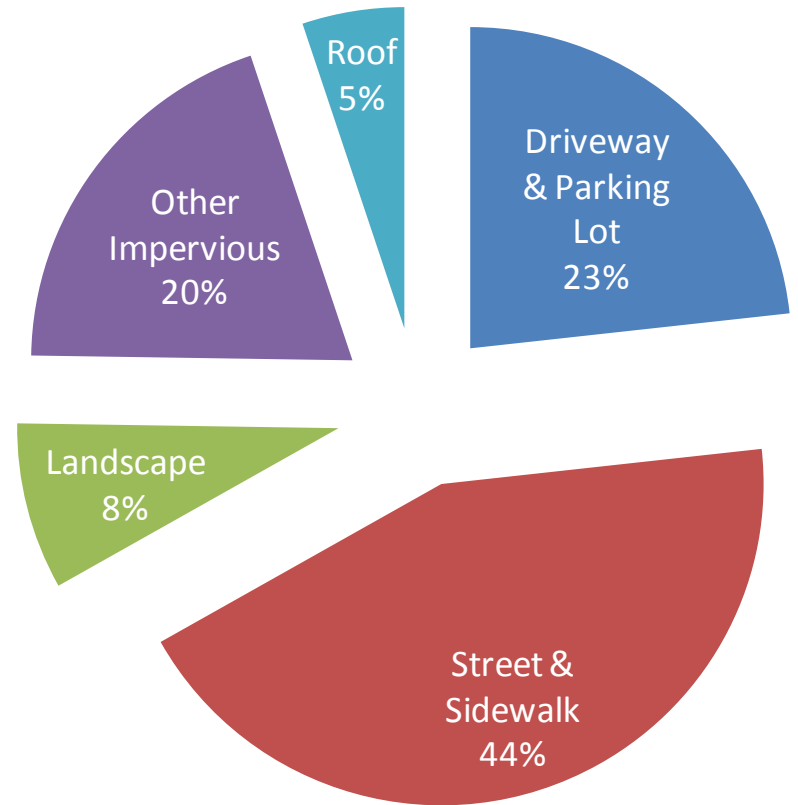
Maintaining  
treatment devices  
under heavy traffic  
conditions.

**The Problem** - stormwater runoff from Seattle's streets poses a threat to receiving waters and is difficult to manage.

City-owned roadways (streets & sidewalks) cover ~16% of the MS4 area but contribute over ~40% the pollutant load.



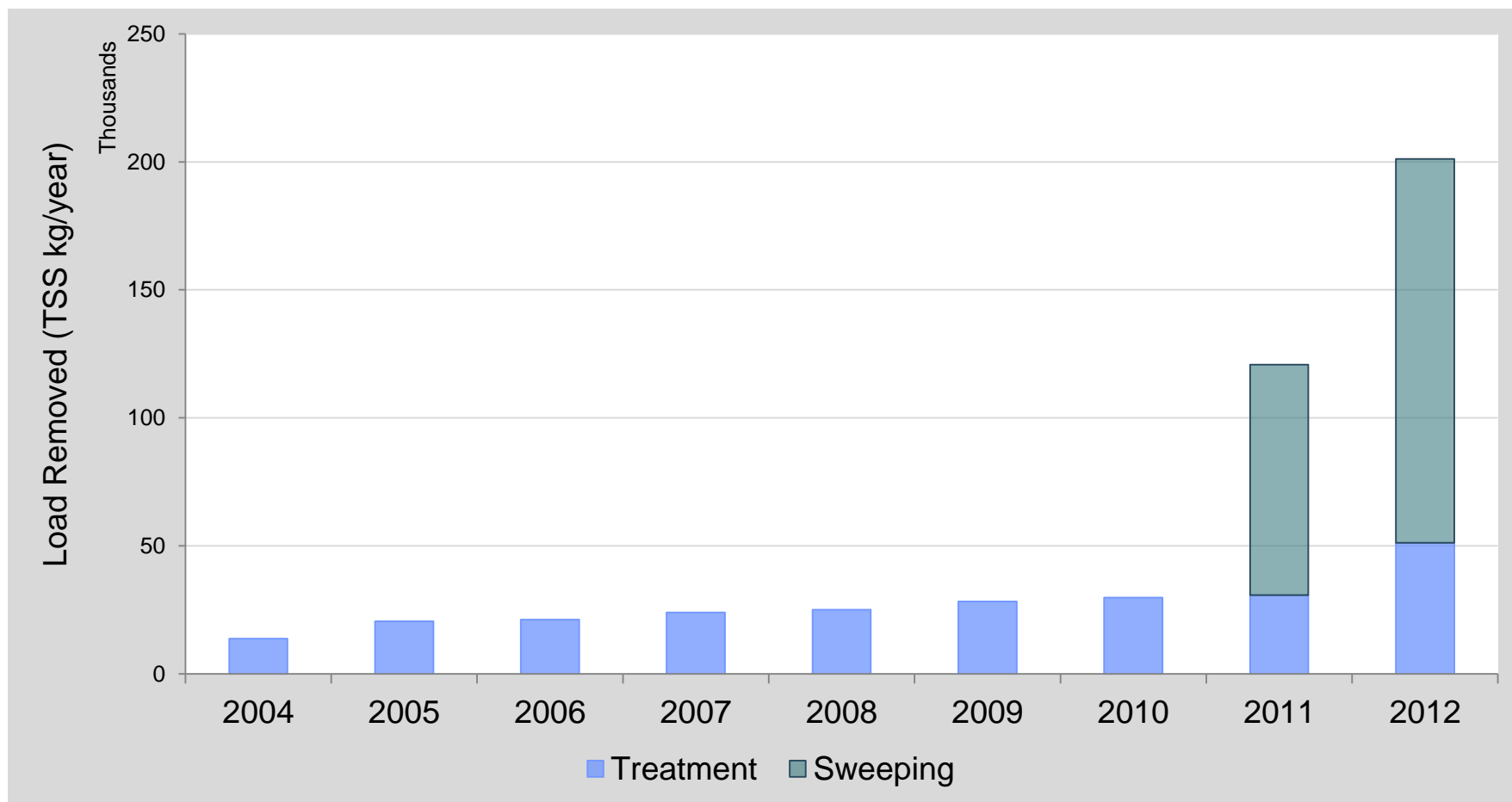
Land use area distribution in MS4 (storm drain).



Pollutant load distribution from MS4 (storm drain).

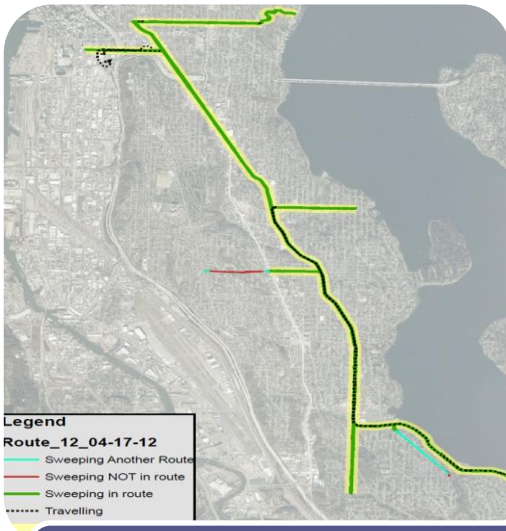
**The Opportunity** – a significant portion of the stormwater load runs off city-owned right-of ways.

Two years (2011-2012) full-scale operations show street sweeping is effective, practical, and readily implementable.



**The Solution** – By 2012 sweeping contributed 2/3 load reduced from city-maintained facilities (19 swales, natural drainage systems, & rain gardens; 2 sand filters; 8 filterrras; 121 CB and 3 StormFilter vaults; 16 swirl concentrators; 2 wet ponds; and 7 wet vaults).

# Street sweeping outcomes are measurable - controls in-place to measure/report progress for SDOT reimbursement.



AVL to track route and mileage in the MS4



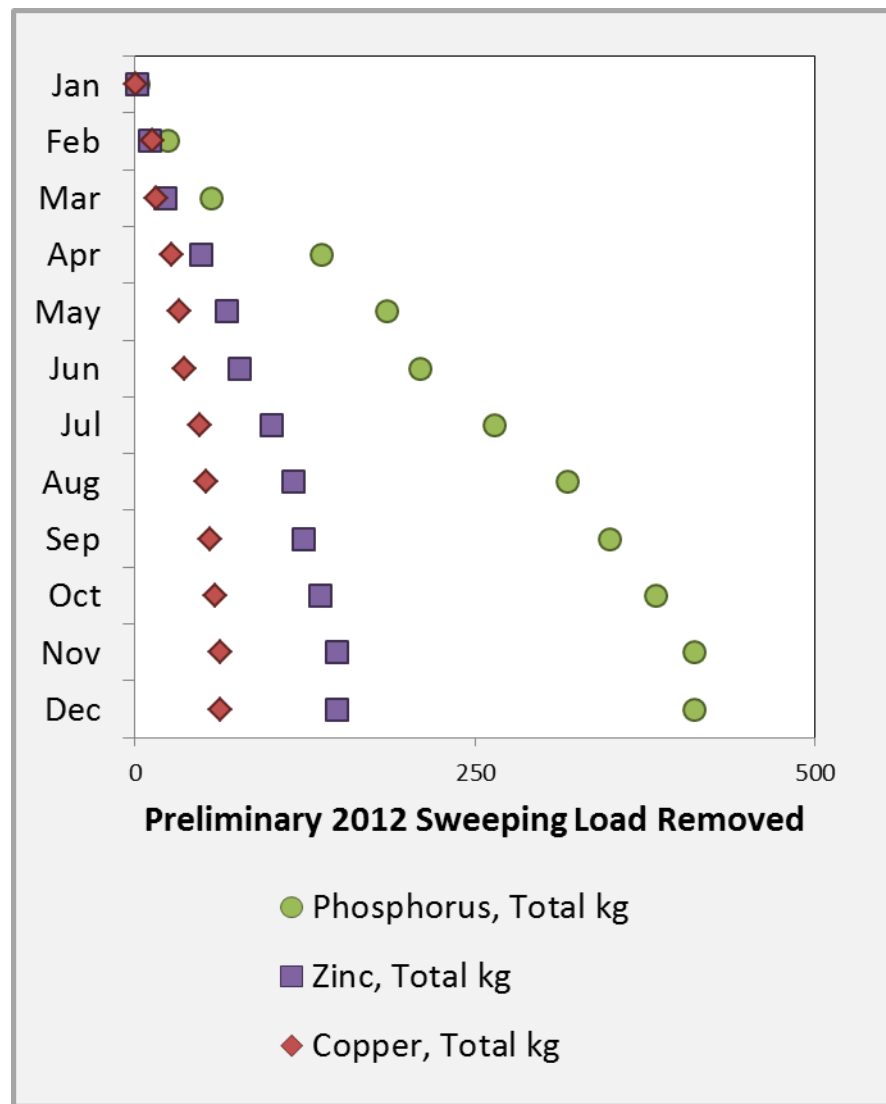
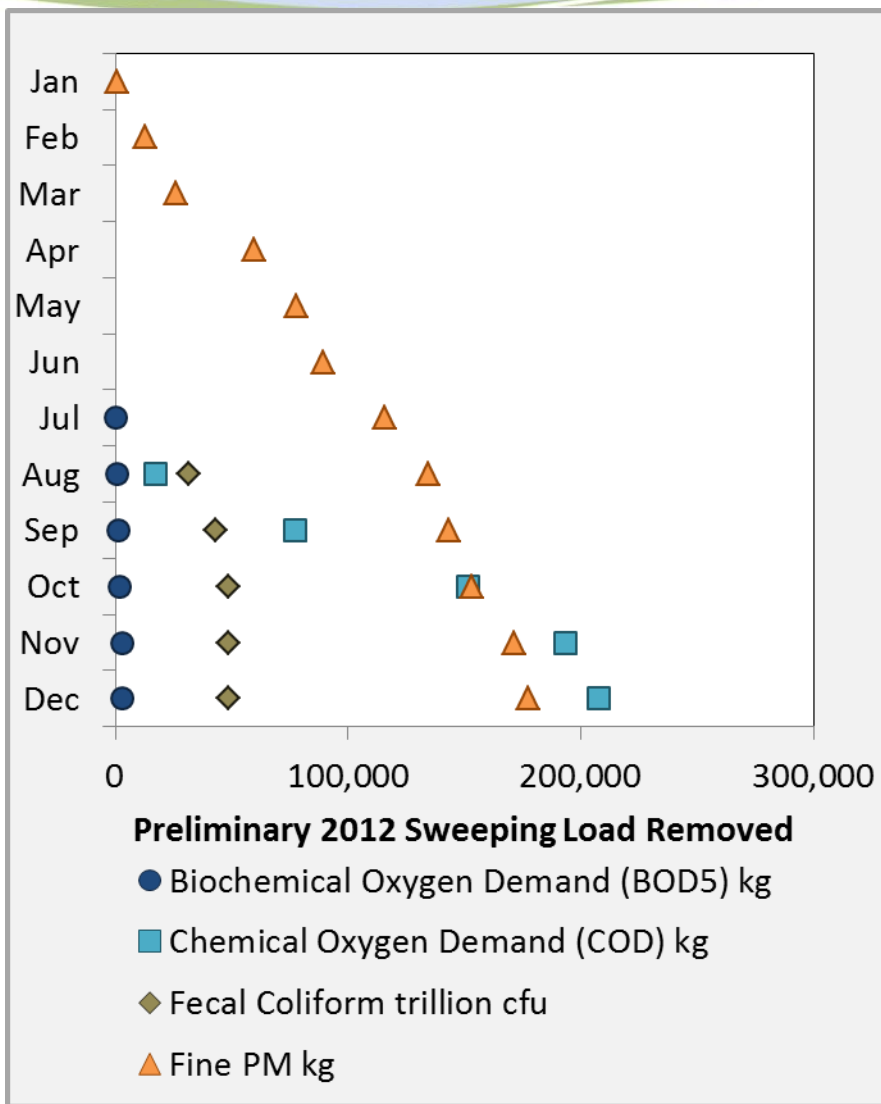
Onboard scales and tipping weight to verify wet load removed



Sampling to estimate pollutant loads removed

**The Solution** – Clean Streets for a Clean Sound. Onboard Automatic Vehicle Location (AVL) and scale systems to track sweeping performance. Sampling to estimate pollutant load removed.

# Street sweeping results are substantial - removing a significant stormwater pollutant load, in addition to solids.



**The Solution** – cumulative load removed for selected parameters (FC, BOD, COD partial year). Almost 1,000 pounds of total phosphorus, equivalent to over 400 bags 10-10-10 fertilizer.

# Street sweeping sampling is doable - sampling program designed to meet three primary objectives.

## Confirm performance expectations

- **Questions:** Are operational targets met (swt, kg Fine PM)? Pickup rates (swt/curb mile, Fine PM kg/curb mile)?
- **Measurements:** Wet load, curb miles, sweeping time
- **Variables:** sweeping velocity and frequency, season, land use, street type
- **Sample Analysis:** Total Solids, Grain Size

## Estimate water quality benefits

- **Questions:** Does sweeping reduce the annual stormwater pollutant load (suspended, dissolved, and bed load fractions)?
- **Measurements:** Wet load
- **Variables:** season, land use, street type
- **Sample Analysis:** Whole sample: total solids, grain size, metals and SPLP metals, nutrients, oxygen depletion, bacteria, petroleum hydrocarbons, PAHs, PCBs, SVOCs and VOCs. Less than 250 um split: all analytes above except oxygen depletion, bacteria, petroleum hydrocarbons, and VOCs.

## Demonstrate sweeping meets expectations

- **Questions:** Is street sweeping meeting performance expectations and delivering the projected water quality benefits?
- **Method:** Annual status report

**The Solution** – Clean Streets for a Clean Sound. After initial sampling establishes seasonality, variability, and parameters of concern, ongoing sampling frequency will be adjusted.

# Street Sweeping – a practical, proven solution for reducing stormwater pollutant loads discharging to Seattle’s waters.

- Follows managing by objectives principles – increasing the odds the program will succeed at meeting water quality benefit targets:
  - **Specific** – Route plan specifies frequency, location, and sweeping velocity to meet target pollutant load reduction.
  - **Measurable** – controls are in place to measure time and miles swept in the MS4, the wet load removed, and the pollutants attached to that load.
  - **Achievable** – 2-year full-scale operations shows sweeping is a viable approach. Real-time information available to adaptively manage – increase/decrease frequency or velocity, expand/change coverage, add curb access controls, etc. to meet objectives.
  - **Realistic** – established partnership between SPU and SDOT, utilizes city resources to meet multiple city-wide objectives.
  - **Time-scaled** – Monthly progress reports. Sweepers replaced every five years with the latest technology (replacement cost accrued through operations, no additional capital required).

